

A LARGER BIVALVE ARTHROPOD FROM SADME EDEOWIE-1 WELL OF PROBABLE CAMBRIAN AGE

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Summary

JELL, P. A. (1983) A larger bivalve arthropod from SADME Edeowie-1 well of probable Cambrian Age. *Trans. R. Soc. S. Aust.* **107**(2), 123-125, 31 May, 1983.

A large bivalve arthropod carapace from 494.92 m down SADME Edeowie-1 well situated 7 km northeast of Brachina Siding just west of the Flinders Ranges is described as *Papilocaris arrugia* gen. et sp. nov. Its age and rock formation are indeterminate but an Early or Middle Cambrian Age is most probable. The distinctive carapace ornament, interpreted as probably having a secondary respiratory function, may have developed from or into the ornament of *Tuzoia* Walcott but no phylogeny can be established.

KEY WORDS: Bivalve, arthropod, Flinders Ranges, Early, Mid Cambrian, new species.

Introduction

Knowledge of large bivalve arthropods from Australian sediments is not extensive (Chapman 1903; Glaessner 1979; Jell 1980; Rolfe 1966) so any new information is significant.

The South Australian Department of Mines & Energy (SADME) Edeowie-1 well, situated 7 km northeast of Brachina Siding at 31°16.7'S, 138°26.6'E on the Parachilna 1:250 000 geological map (Dalgarno & Johnson 1966), in the Pirie-Torrens Basin on the western edge of the Flinders Ranges, produced the single specimen described below.

It was split from the 60 mm core recovered from a depth of 494.92 m below the surface and is contained in a grey-green mudstone. A palynological determination on carbonaceous shale from 333.4–333.5 m down the same well indicated a Late Eocene age so providing an upper limit to the possible age of this fossil.

Determination of the rock unit and age of this fossil is inconclusive but may be inferred with some confidence from circumstantial evidence. The sequence in which the fossil-bearing core occurs in Edeowie-1 well has a gross lithology comparable with the Cambrian Billy Creek Formation, Balcoracana Formation, or Pantapinna Sandstone (lower part of uppermost outcropping part), and it is considered that the sequence is most likely upper Balcoracana Formation or possibly lower (red) Pantapinna Sandstone. Although Precambrian Adelaidean sediments have been reported from drill-holes in the Pirie-Torrens Basin (e.g. in SANTOS Motpena-1, 19 km northwest of Edeowie-1, Dalgarno and John-

son, 1966), the core in Motpena-1 well at least is now considered to resemble Balcoracana Formation more closely' (D. J. Gravestock, *in litt.*).

Other large bivalve arthropods (*Isoxys communis* Glaessner 1979 and *Tuzoia australis* Glaessner 1979) were described from the Early Cambrian Emu Bay Shale on the northern shore of Kangaroo Island (Glaessner 1979) in similar lithology. As the specimen is referred to a new genus it provides no basis for correlation at this level; as suprageneric classification of this and similar dissociated carapaces is uncertain no dating is available on a strictly taxonomic basis except that such carapaces are not known from post-Triassic rocks. However, as discussed below, this genus is comparable with several Cambrian genera of bivalve arthropods and is distinct from post-Cambrian forms. Taken together, this biological evidence and the regional geology make a Cambrian age very probable.

PHYLUM: ARTHROPODA
CLASS, ORDER AND FAMILY:
UNCERTAIN
GENUS: PAPILOCARIS nov.

Etymology: From the Latin *papilio* meaning a butterfly and *caris* meaning a shrimp. The name refers to its resemblance to and initial identification as possibly an insect wing. Gender is feminine.

Type species: *Papilocaris arrugia* sp. nov.

Diagnosis: Carapace bivalve with straight hingeline. Valves ovoid, with marked posteroventral expansion; anterior hinge process large and prominent, projecting farthest some distance below hingeline. No marginal spines on

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hinge, anterior or ventral margins. Surface with pattern of longitudinal ridges, joined in a meshwork near anterior margin but independent for most of their length and breaking up into short segments in places.

Discussion: The problems of classification of phyllocarid-like carapaces in the absence of thoracic and abdominal details have been extensively considered. (Briggs 1976, 1977; Glaessner 1979 and others). However, isolated carapaces are not uncommon in Palaeozoic sediments and the established generic level taxonomy has proved useful for such fossils (e.g. Robison & Richards 1981). Although a number of phyllocarids are known with longitudinal to oblique ridges (Rolfe 1969) the ornament of this specimen is unknown in any similarly shaped arthropod carapace and together with the nature of the anterodorsal projection forms the basis for the new genus.

Overall shape is most reminiscent of genera such as *Canadaspis* Novozhilov (cf. Briggs 1978, figs 18, 19, 51) whose main distinguishing feature is the posteroventral expansion. The ornament may be functionally similar to the polygonal ornament of *Tuzoia* Walcott (see Robison & Richards 1981, pl. 7, fig. 2) from which it may be derived by streamlining—possibly suggesting a faster moving animal. An alternative argument may be that *Tuzoia* evolved from a smooth form and *Papiliocaris* appears to be an intermediate. A possible functional interpretation of the ridges is that they house a secondary respiratory system as suggested by Jell (1978) for trilobites. The ridges increase the surface area considerably, were ideally situated in the water flow past the body, and their absence posteriorly is understandable also with that interpretation. If this interpretation is correct then no phylogenetic relationship may be inferred from the ornament as such ridges developed in many different trilobite lineages at different times. As these genera, with which some comparison may be made but no certain kinship may be inferred, are all of Early or Middle Cambrian age *Papiliocaris* seems most likely to be of Cambrian age also but this is by no means certain.

***Papiliocaris arrugia* sp. nov.**

Figs 1–2

Etymology: From the Latin *arrugia* meaning a shaft or pit in a mine—referring to its discovery in a borehole.



Fig. 1. *Papiliocaris arrugia* sp. nov. GSSA Fossil Collection No. Cr43. A, lateral view of latex cast of external mould of left carapace valve, $\times 3$. B, lateral view of internal mould of anterior half of left carapace valve, $\times 4$.

Material: The holotype carapace registered in the Geological Survey of South Australia Fossil Collection as No. Cr43. It is preserved as internal and external moulds (no shell preserved) with only half the internal mould still present.

Diagnosis: As for genus.

Description Left carapace 37 mm long, 10 mm high at anterior and 22 mm high posteriorly. No rostral plate present. Anterior and ventral profiles broadly convex but original convexity must have been somewhat greater as wrinkles, due to flattening, are visible near hingeline in anterior half and near posteroventral margin. Outline (Fig. 2) drawn from latex cast which shows dorsal part of posterior margin; it is continued posteroventrally in smooth curve. Anteriorly margin turns down from straight hingeline in a little more than 90° angle, curves gently forward for 4 mm, then turns abruptly back parallel to hingeline for a short distance to edge of main body of carapace and from this point again curves forward to most anterior point on margin.

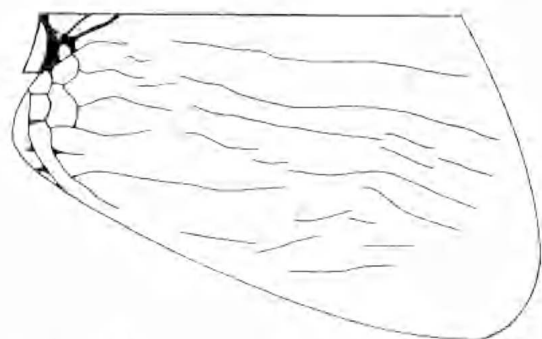


Fig. 2. *Papiliocaris arrugia* sp. nov. Camera Lucida sketch and reconstruction of left carapace valve showing pattern of ridges.

Ventrally margin straight to very gently convex and slopes down to produce postero-ventral expansion. Flat narrow border adjacent to margin throughout except anteriorly where considerably wider. Inside the border is the convex body of the carapace. Ornament of prominent longitudinal ridges on body that are linked together anteriorly by two or three vertical ridges running parallel to anterior margin and forming an irregular meshwork en-

closing quadrangular or polygonal shapes. Posteriorly 5 or 6 main ridges wavy, discontinuous in some places and finishing well before posterior margin. On anterodorsal border a few less prominent ridges visible with two running diagonally up and back to hingeline.

Remarks: The sharp break in the anterior margin may well be a fracture of the carapace with the lower part turned down into the matrix; the margin would have been evenly curved if that was the case. However, the margin just below the break appears to be a true edge and the question must remain open. Even if the anterior margin proves not to be distinctive, the carapace ornament is unique so as to warrant erection of the new taxon.

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